Materials Are "Key to Progress" in Aerospace
Maj. Gen. O. J. Ritland
(See story, p. 5)

April, 1961

MR

STACKS

METALS REVIEW

The News Digest Magazine

The 16th METALLOGRAPHIC EXHIBIT

Detroit, October 23 to 27, 1961

All metallographers—
everywhere—
are cordially invited to
display their best work.

RULES FOR ENTRANTS

Exhibitors do not need to be members of the American Society for Metals.

Work which has appeared in previous metallographic exhibits held by the American Society for Metals is unacceptable.

Photographic prints should be mounted on stiff cardboard, extending no more than 3 in. beyond edge of print in any direction; maximum dimensions 14 by 18 in. (35 by 45 cm.). Heavy, solid frames are unacceptable.

Entries should carry a label on the *face of the mount* giving:

Classification of entry.

Material, etchant, magnification and other desirable data.

A brief statement (if desired) calling attention to any unusual aspect of the entry.

The name, company affiliation and postal address of the exhibitor should be placed on the *back of the mount* together with a request for return of the exhibit if so desired.

Entrants living outside the United States should send their micros by first-class letter mail endorsed "Photo for Exhibition — No Commercial Value — May Be Opened for Customs Inspection".

Exhibits must be delivered before Oct. 10, 1961, either by prepaid express, registered parcel post or first-class letter mail, addressed:

Metallographic Exhibit
American Society for Metals
Metals Park
Novelty, Ohio, U. S. A.

CLASSIFICATION OF MICROS

Class 1. Irons and steels, cast and wrought
Class 2. Stainless steels and heat resisting alloys
Class 3. Aluminum, magnesium, beryllium, titanium and their alloys
Class 4. Copper, nickel, zinc, lead and their alloys
Class 5. Uranium, plutonium, thorium, zirconium and reactor fuel and control elements
Class 6. Metals and alloys not otherwise classified
Class 7. Series showing transitions or changes during processing
Class 8. Welds and other joining methods
Class 9. Surface coatings and surface phenomena
Class 10. Slags, inclusions, refractories, cermets and aggregates
Class 11. Electron micrographs using replicas
Class 12. Electron micrographs (transmission)
Class 13. Color prints in any of the above classes
Class 14. Results by unconventional technique

AWARDS AND OTHER INFORMATION

A committee of judges will be appointed by the Metal Congress management which will award a First Prize (a medal and blue ribbon) to the best in each classification. Honorable Mentions will also be awarded (with appropriate medals) to other photographs which in the opinion of the judges closely approach the winner in excellence. A Grand Prize, in the form of an engrossed certificate and a money award of $500 from the Adolph I. Buehler Endowment will also be awarded the exhibitor whose work is judged best in the show, and his exhibit shall become the property of the American Society for Metals for preservation and display in the Society's national headquarters.

All prize-winning photographs will be retained by the Society for one year and placed in a traveling exhibit to the various Chapters.

43rd NATIONAL METAL CONGRESS & EXPOSITION

Cobo Hall, Detroit——————Oct. 23 to 27, 1961

April, 1961 Vol. XXXIV, No. 4

METALS REVIEW

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Contents

Blueprint for the Aerospace Age, by Maj. Gen. Osmond J. Ritland 5
New Metals Handbook—Behind the Scenes Planning and Production 7
Nominating Committee for ASM National Officers Appointed 7
The Strength of ASM—Advisory Committees of and for 34,000 Members 8
Scholarships in Metallurgy, by Anton deS. Brasunas 10
Outstandingly Successful Meeting in New Mexico, by E. E. Thum 11
Monograph Series on Metals in Nuclear Applications 11
Editorial Advancements in ASM Periodical Publication Area 12
Penn State's McFarland Award to George H. Todd 16

Important Chapter Lectures

Toolsteel Performance as It Affects Production, by Russel H. Boettger **(Detroit)** 12
Special Stainless Steels, by Adolph J. Lena **(Penn State)** 13
Refractory Metals and High-Temperature Alloys, by R. W. Fountain **(Wilmington)** 13
New Tool for Science and Industry, by Ralph H. Miller **(Los Alamos)** 14
A Backward Look at Research, by Paul D. Ffield **(Lehigh Valley)** 14
Hot Extrusion of Steel, by Kenneth G. Hookanson **(Chicago)** 14
Recent Developments in Production Heat Treatment, by J. E. Tripp **(Peoria)** 15
Sonic Testing in the Steel Industry, by Gordon Meldrum and W. C. Harmon **(Los Angeles)** 15
Conversion of Radiation Into Electrical Energy, by Fred D. Rosi **(Washington)** 16

Departments

Editor's Page	4	Chapter Briefs	21
Important Meetings	11	Chapter Calendar	22
Men in Metals	17	Employment Service Bureau	23
R & D News	20	3-Minute Glass	26

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The Editor's Page

As winter took one of its last pot shots at the vicinity of Metals Park and the North Central States, I for one, could find some of the brighter aspects of travel. On an extensive motor trip with Los Angeles and the Western Metal Congress and Exposition as its ultimate goal, stops were made in St. Louis, Kansas City, Wichita, Tulsa, Oklahoma City, Albuquerque, Phoenix and San Diego. Officers of most of these chapters arranged excellent weather. Thus, it was rather rewarding after a long day of travel and an evening meeting to pick up a newspaper and read of the snow, sleet and cold weather we had left behind.

Recognition

From time to time mention has been made, here and elsewhere, of the need for a better understanding of metallurgists, metallurgy, materials engineering, materials science and the other varied titles and descriptions used to designate the vital and vibrant field in which we work. So it is with considerable pleasure that we compliment the Wichita Chapter on its recent coup. The coincidence of a national officer visit by Dr. Bill Pennington and the centennial celebration of the state caused chapter thinking wheels to click. As a result, the governor was prevailed upon to issue a proclamation designating the week of Mar. 29 as Metallurgist's Week in Kansas. High state officials promised to attend the meeting to add their blessings to the affair.

Fancy Notions

More effort of the type will do much to eliminate the forces of ignorance which lay the groundwork for such tru-life anecdotes as the one recently told me by a friend. His parents, born in Europe, had the hearty respect for education common in those countries. When the friend announced to his parents he was to study metallurgy, they needed the explanation that this involved a study of metals. His parents, in the way parents are prone to do, bragged about their son's preparation for a career to some of their fellow newcomers. When the necessary explanation was made of what metallurgy is, this was the rejoinder: "What! Do you now have to go to college to be a junkman?"

Tourist Season

With spring bursting out all over, we at Metals Park expect to see a steady stream of visitors. Your ASM headquarters building is quite a tourist's mecca. During the summer season guests from all over inspect the building and grounds. Many ASM members, traveling via the Ohio Turnpike, take a slight detour to personally see the famed geodesic dome and ultra-modern office structure. Estimates of visitors during the less than two-year occupancy are widely varied, but a reasonable guesstimate indicates a total of more than 50,000 guests.

Educational Kit

Perhaps this report is slightly premature. Nevertheless, interest in the subject is so high that we must share the knowledge. Late this summer there will become available a metallurgy kit for use by youngsters of high school age. Necessary ingredients, equipment and instructions for some 65 metallurgical experiments will be included in the modestly priced kit. Vital assistance was given the manufacturer of the kit by a special subcommittee by ASM's Advisory Committee on metallurgical education. Many chapters which have been given advance information on the kit are making plans to donate them to high school science teachers. The feeling is that if the instructor can be made to understand and become familiar with the field of metals technology, he might better be able to counsel his students.

New Publications

Early reports indicate that ASM's newest publications are unqualified successes. These are, Volume 1, 8th Edition, Metals Handbook and the new Metals Engineering Quarterly. An equal reception is anticipated, based on prepublication comment, for the new Transactions Quarterly.

T. C. DuMond

BLUEPRINT FOR THE AEROSPACE AGE

Excerpts from an address by Maj. Gen. O. J. Ritland, Commander Air Force Ballistic Missile Division, Air Research and Development Command, at the special Air Force briefing session held in conjunction with the ASM Western Metal Congress in Los Angeles, Mar. 20, 1961

In the building of our aerospace forces, metals and materials have assumed a dominant role. The shape of our defense in the immediate future is molded from inter-related developments in three major fields: electronics, propulsion and metallurgy. It is this latter field which is of primary concern to us today.

Operational ballistic missiles, such as Thor and Atlas, depend for their structural integrity on alloys engineered to accommodate performance characteristics of these aerospace systems. Air and spacecraft of tomorrow impose new and severe demands on the properties of metals. In our continuing effort to reach higher, faster and farther, we must wrap our concepts in metal structures which will support great weight themselves, and which can survive slashing speeds and re-entry temperatures.

The potentials of space as an arena for military operations have become increasingly apparent, due largely to the advent of the ballistic missile. Our front line of defense today extends along the broad perimeter of the air and into the spaces beyond our earth's atmosphere. America's assurance of continuing peace will surely be compromised if we fail to lead in the development and application of

Major General Ritland is a command pilot with more than 9000 flying hours to his credit. In his 27 years of military service he has amassed the equivalent of more than one full year at aircraft controls. For the past few years he has been devoting his abilities primarily to research and development of Air Force ballistic missile weapon systems.

Born in Berthoud, Colo., he attended San Diego State College for three years before beginning Air Corps cadet training at Randolph Field, Tex., in 1932. After completing advanced flight training at Kelly Field, Tex., in 1933 and serving at March Field, Calif., he went on inactive status in 1935, and became a pilot for United Airlines. In 1939, Gen. Ritland accepted a regular commission and was assigned to Hamilton Field, Calif. Later that year he was transferred to Wright Field, Ohio, for a 5-year tour as a test pilot. Gen. Ritland was awarded the Distinguished Flying Cross for his test flying at Wright Field. He was associated with programs to carry out engineering, flight performance and functional testing of many American aircraft used during and immediately after World War II.

As a Wright Field test pilot he flew more than 200 different aircraft, including experimental versions of the P38, the P39 and P40; the P47 and P51; the B17, B19, B26 and B29; the B32, C46 and C54. He was also one of the first pilots to fly prototype jet aircraft, such as the XP59 and XP80. He also evaluated enemy combat types, including German and Japanese fighters, at Wright Field.

Transferred to the China-Burma-India theater in December 1944, Gen. Ritland served as commander of the Assam Air Depot, India, until 1946. Upon his return to the United States he was again assigned to Wright Field where he worked in procurement of Air Force experimental aircraft and in research and development required for continuous evaluation and improvement of all USAF aircraft. Assigned to the Special Weapons Command at Kirtland Air Force Base, N. M., in February 1950, he organized and commanded the 4925th Test Group (Atomic), which was responsible for development testing of all equipment needed in attaining an Air Force nuclear weapons capability. His Test Group also assisted the Atomic Energy Commission and the Armed Forces Special Weapons Project in nuclear weapons effects tests and developed an operational technique for airborne sampling.

In support of the U. S. nuclear weapons program, Gen. Ritland also organized, directed and exercised operational control of all aircraft participating in AEC Nevada Proving Ground atomic testing and received the Legion of Merit for his outstanding achievements.

functional aerospace systems to counter aggression.

It is the responsibility of the military to identify our defense needs and to conceive the systems best qualified to fulfill those needs. We look to our country's technological and industrial resources for the know-how that can translate these concepts into realities. In the critical matter of developing new materials and products—from the smallest transistor to the mightiest airframe—we depend on the experts for the answers to our requirements.

Our bid for peace is based on the maintenance of a strong counterforce. Our mission is clear-cut. We seek to defend the United States against aggression and to preserve the peace for our democracy and for freedom-loving peoples everywhere.

This is a particularly demanding challenge to us in the Air Research and Development Command where today's research influences tomorrow's security.

The defense mechanism that exists in the United States today is the product of diligent work and enlightened vision. The formula for national security and progress in the years ahead can be no less demanding. We must apply our wisdom, our foresight, our imagination, and our research and production capacities to the requirements of the aerospace age, and we must apply them in urgent and dynamic fashion.

AEROSPACE SYSTEMS

Now, what are the systems that have emerged recently and what are the future systems that merit consideration in these formative years of the aerospace age?

In the first place, there are the ballistic missile weapon systems that have ushered in this new era. The potential of the V-2 rocket and the thermonuclear breakthrough pointed straight in the direction of the intercontinental ballistic missile. The air superiority we had fashioned as a deterrent force had to be expanded into an aerospace capability. We have attained, in less than a decade, an astounding ballistic missile technology. We have produced and deployed a force of 60 Thor missiles. We have brought Atlas to operational status and have developed two types of powerful Titan missiles.

With Minuteman, to be operational in 1962, we will have arrived at the ICBM system best qualified to provide the United States with an economical deterrent force. Minuteman missiles will lurk in underground sentry boxes and will ride the rails in mobile deployment.

Regardless of the longevity of these systems, any country which stakes its national integrity on the capabilities of a single military weapon is limiting, and perhaps jeopardizing, its very security. Maximum effectiveness of missiles depends on the support of other systems with missions to perform in the environment of space itself.

Additional military efforts along these lines have been devoted to systems that will strengthen our ballistic missile forces. The Discoverer program is proving many of the components of future military and scientific satellite systems. One of these is Midas, the missile dedense alarm system, designed to provide early warning of a ballistic missile attack.

We can also underline our attitude of deterrence by certifying our communications capability. To utilize our extensive military forces effectively it is essential that we have dependable global communications, such as the Army's Advent system.

At the Air Force Ballistic Missile Division we are engaged in 19 major ballistic missile and space programs. We are fortunate to have the unparalleled resources of a tremendous nation-wide government-science-industry team in our concentrated assault on our problems.

SPACE-AGE PROBLEMS

There are many obstacles facing us on the road to space; obstacles which we as a team must isolate and overcome. If we are to depend on satellite systems for early warning, for communications, and other applications, we must be assured of continuous operation of the instruments that will perform such functions.

If successful operation of satellite systems in the numbers required is to be practical, we must achieve three objectives: simplicity of payload, reliability for all components and for the satellite itself, and reduced cost for each launch.

Here is where technological breakthroughs are demanded. These problems encompass challenges which industry must solve if we are to benefit mutually from the unfolding of the space frontier. By responding jointly to these challenges we shall not only strengthen the defense of this nation, but we shall be creating new markets for American enterprise.

Progress in aerospace technology is no longer possible simply by making isolated advances in a particular technical area. Today's aerospace systems are highly integrated, demanding simultaneous progress in a variety of sciences. More than ever before, progress now hinges on one prerequisite—the availability of materials to meet the unique requirements of the space environment. Thus, materials have become the "key to progress" in aerospace.

Recent developments emphasize the increasing importance of metallurgical research in support of our missile and space programs. Consider the problems of re-entry and of suitable materials for rocket propulsion systems. Successful solution of these problems came about by introducing novel ways of using old materials and by creating entirely new materials.

The matter of weight savings is of great importance. To cut our launching costs and give us more pounds of usable payload in orbit, future satellites must be made from stronger, lighter-weight materials. To the significant advances already recorded in refractory metals and in the fabrication of lightweight structures, must be added even greater progress in the development of many new alloys and other materials. In the field of metallurgy as in all of science, there can be no respect for the status quo.

The ultimate objective we seek in our aerospace programs is to deter aggression and to reinforce the peace. We shall do this most effectively when we have created and put into use those military systems calculated not only to deter attack, but capable as well of prevailing in conflict if war should be thrust upon us. Our bombers, missiles, satellites, and submarines must be able to survive attack and strike back against the enemy. This then, is our blueprint for security; our military strategy in the elusive but eternal quest for peace.

New Metals Handbook

Behind-the-Scenes Planning and Production

More than 1300 contributors, in conjunction with the editorial staff, have worked hard and long to make the new Metals Handbook volume the most useful and most complete reference of its kind. Because of the book's size and scope, the behind-the-scenes story of its production is of more than routine interest.

Preliminary planning—the selection of appropriate subjects and the development of a format for their presentation—was the joint responsibility of the Metals Handbook Committee and the editorial staff. These men also decided whether the various subjects could be more adequately handled by author committees or individual specialists.

With this much of the groundwork laid, chairmen were secured for author committees, largely through the efforts of the Handbook Committee. In organizing these 83 committees, specific attention was given to wide industrial coverage, so that each article might include the viewpoints and contributions of men from different industries. The technical resources of the ASM membership were enlisted to a major degree—the 1300 committee members came from more than 500 plants, and from virtually every ASM chapter in the United States and Canada.

Meeting agendas were usually lists of information and data considered most important by the committee chairman and staff. These agendas were mailed to committee members three weeks before the first meeting, thus acquainting them with the suggested scope and saving much time for the committee during its first meeting.

The purpose of the first meeting of each committee was to determine which data and information would be the responsibility of each member. Submissions of data from the individual members after the first meeting were then circulated about two weeks before the second meeting. This permitted the committeemen to study the data in advance and saved time in coming to an agreement on the technical substance at the second and final meeting.

After the second meeting, the chairman of each committee and the staff assembled the various contributions into the form of an article for review by its author-committee. Concurrently, work was underway at headquarters on the illustrations and tables, giving particular attention to arranging the tabular and graphical data for presentation in the minimum space consistent with the importance of the particular data.

While the review manuscripts were being checked by their author-committees, copies were sent also to the chairman of the Metals Handbook Committee, who in turn delegated review of each article to one or more qualified members of the Handbook Committee. Suggestions received during this review invariably strengthened the subject matter and gave it better balance.

At this point, printing production was started. As typesetting proceeded, galleys were returned to headquarters for proofreading by the staff and, in most instances, by the committee chairmen. Revised galleys, figures and tables were then arranged in page layouts by staff members. Indexing was begun and kept pace with page layout.

Page proofs were then made from the paste-ups and returned to ASM headquarters for checking. From the OK'd pages the printer then made "reproduction proofs," which were photographed to provide a film negative of each page. From these negatives, film positives were made by contact printing, and were stripped together in groups of eight consecutive pages for platemaking. At each stage of film operations, the pages were inspected for film defects, and when all pages were approved on positive film, the eight-page films were contacted to sensitized copperized aluminum lithograph plates for the printing presses.

Forty thousand copies were printed and folded on a high-speed rotary press, utilizing 260,000 lb. of paper. Finally began the slow process of sewing the folded printed "signatures" and binding them into a book. The very last operation, of course, was shipping one book to each ASM member who had qualified to receive it, and these members (we understand) are now using the book every day and increasing their knowledge and technical efficiency at a truly amazing rate.

Nominating Committee for ASM National Officers

In accordance with the Constitution of the American Society for Metals, President William A. Pennington has selected a nominating committee for the nomination of president (for one year), vice-president (for one year), treasurer (for two years), and two trustees (for two years each). This committee was selected by President Pennington from the list of candidates submitted by the chapters. The personnel is:

Harold George Warrington, Chairman, Manager of Sales and Technical Services, Dominion Magnesium, Ltd., 320 Bay St., Toronto 1, Ont., Canada (Ontario); Robert W. Bohl, Professor of Metallurgical Engineering, University of Illinois, Urbana, Ill. (Sangamon Valley); Henry A. Curwen, Production and Sales, Earle M. Jorgensen Co., Los Angeles, Calif. (Los Angeles); George Dolch, Jr., Materials Engineering Manager, Thompson Ramo Wooldridge, Inc., 23555 Euclid Ave., Cleveland 17, Ohio (Cleveland); James S. Meyer, Senior Metallurgist-Production Engineer, International Business Machines, Inc., Endicott, N.Y. (Southern Tier); William F. Smith, Research Metallurgical Engineer, Reynolds Metals Co., Richmond, Va. (Richmond); George F. Sommer, Assistant Chief Engineer, Link-Belt Co., Indianapolis, Ind. (Indianapolis); Charles A. Turner, Chief Metallurgist, Research and Development-Sales Engineering, Selas Corp. of America, Dresher, Pa. (Philadelphia); Dean G. Wilson, General Supervisor, Coal Processing and Chemistry - Research, Columbia-Geneva Steel Division, United States Steel Corp., Provo, Utah (Utah).

This committee will meet during the third full week in the month of May. They will welcome suggestions for candidates in accordance with the ASM Constitution, Article IX, Section 1 (b), which provides that endorsements of a local executive committee shall be confined to members of its local chapter, but individuals of a chapter may suggest to the nominating committee any candidates they would like to have in office. Endorsements may be sent in writing to the chairman or any other member of the committee.

The Strength of the ASM: Committees of and for 34,000 Members

REPRESENTING 1300 MEMBERS AND FRIENDS OF ASM WHO WROTE THE NEW METALS HANDBOOK, *8th Edition, Vol. 1, "Properties and Selection of Metals," are these members of the ASM Handbook Committee, meeting at Cleveland-Hopkins Airport.* Nathan E. Promisel, *committee chairman for six years and member of Washington Chapter, is seated left. Next to him is* Ralph W. E. Leiter, *Philadelphia Chapter, vice-chairman. Standing from left are* George Dolch, Jr., *Cleveland Chapter;* A. L. Hartley, *Cincinnati Chapter;* W. L. Burch, *Buffalo Chapter;* E. E. Staples, *Milwaukee Chapter;* Carl H. Samans, *national trustee;* D. J. Wright, *Peoria Chapter;* Cloyd Snavely, *Cleveland Chapter;* P. C. Farren, *Springfield Chapter; and* Melvin R. Meyerson, *Washington Chapter.*

CONFERENCE ROOM AT ASM NATIONAL HEADQUARTERS, UNDER THE GEODESIC DOME, *is setting for meeting of the ASM Finance Committee. Hundreds of ASM committee members use the building each year for the important work they are doing. From left are* Robert J. Raudebaugh, *national treasurer and chairman of the committee;* A. J. Herzig, *Detroit Chapter;* C. H. Stevenson, *Chicago Chapter;* Wilson Trueblood, *Milwaukee Chapter;* Kent R. Van Horn, *Pittsburgh Chapter;* Albert L. Lloyd, *ASM director of administrative services and finance;* Robert H. Aborn, *Pittsburgh Chapter and past national treasurer;* Guido P. Palma, *Rochester Chapter;* Ernest Johnson, *Canton-Massillon Chapter;* B. D. White, *assistant treasurer; and* Allan Ray Putnam, *managing director.*

The real strength of the American Society for Metals surges through its 34,000 members. It's the strength of ideas shared, thoughts expressed. It's *people* working together for the advancement of an entire field. It's the strength that's ever growing in a new profession—materials and process engineering.

There's no better expression of that strength than the ASM advisory committees that meet at the national headquarters in Metals Park or at other convenient locations in Greater Cleveland. From all over North America they come, helping the Society do the challenging work it must do to meet its educational responsibilities.

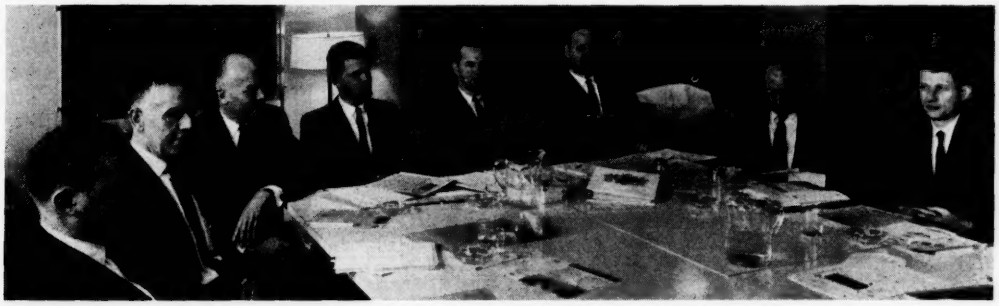
Here, through the camera's eye, are some of these committees at work.

TRANSACTIONS COMMITTEE MEETING *at Cleveland-Hopkins Airport was well attended in spite of airline strike in full swing at the time.* T. E. Leontis *of Saginaw Valley Chapter and committee chairman (right) is discussing a technical paper submitted for the Detroit Metal Congress with* George Enzian, *(center), representative of the ASM Technical Council, and* David Krashes *of Worcester Chapter.*

METALS HANDBOOK, 8TH EDITION VOL. 2 *is the topic of discussion here at a Handbook Committee meeting at Cleveland-Hopkins Airport. From left are* Allan Ray Putnam, *managing director;* Carl H. Samans, *national trustee;* Ernest E. Thum, *director of editorial services; and* Robert J. Raudebaugh, *national treasurer.*

NEW ASM TRANSACTIONS QUARTERLY *commands the attention of* Paul D. Frost, *Columbus Chapter;* L. J. Haga, *West Michigan Chapter;* David Krashes, *Worcester Chapter; and* Albert R. Fairchild, *national trustee.* John Parina *(back to camera), points to the new publication he will edit.*

A GROWING ASM ACTIVITY, THE METALS ENGINEERING INSTITUTE, *is guided by this MEI Advisory Committee, meeting at Cleveland-Hopkins Airport. Planning to implement the home-study school's new Extension Diploma program are (from left)* Allan Ray Putnam, *managing director;* John J. Hoffer, *Rochester Chapter;* George F. Melloy, *Lehigh Valley Chapter;* William Charlesworth, *committee chairman, Muncie Chapter;* Anton deS. Brasunas, *MEI director;* David W. McDowell, Jr., *New York Chapter;* Merrill A. Scheil, *national secretary; and* R. F. Heheman, *Cleveland Chapter.*



Scholarships in Metallurgy

by Anton deS. Brasunas*

More than a third of a million dollars is currently going to metallurgy students, graduate and undergraduate, to aid in their education.

In a recent survey, completed in January 1961, schools giving degrees in metallurgy were asked to supply information on scholarships awarded during the previous academic year. Of 75 schools with metallurgy programs, 51 reported awarding scholarships on the undergraduate level only, 13 on the graduate and undergraduate levels, and 5 on the graduate level only. Four schools had no metallurgy scholarships and two did not report.

The survey found that over $350,000 was awarded to college students pursuing a metallurgical education during the 1959-60 school year. Since many metallurgy students also receive funds from general scholarships, the total amount of scholarship funds awarded annually probably exceeds $400,000.

Undergraduate Scholarships

Sixty-four schools offer 333 scholarships in undergraduate curricula, an average of five scholarships per school. A number of institutions give only one scholarship; the largest number at any one school is 23 (six are awarded to freshmen; six to sophomores; six to juniors; and five to seniors).

The amount of money involved in undergraduate metallurgy scholarships totals $175,225, for an average of $525. One of these scholarships was for $1720 per year, on a four-year basis. Of the 333 undergraduate scholarships, almost half are from technical societies (Table 1 lists other fund sources). In the majority of cases (251), the scholarship is a cash award; 72 cover tuition and books only.

Table 1. Source of Scholarship Funds

Source	Number of Scholarships	
	Undergraduate	Graduate
1. Industry	121	49
2. Foundations or Societies	154	2
3. Municipal Funds	12	5
4. University Funds	40	3
5. Individuals	6	0
	333	59

The breakdown on recipients of metallurgical scholarships is as follows: 38 freshmen, 92 sophomore, 107 junior, 83 senior and 13 fifth-year students, where five-year programs exist. Selection of scholarship recipients is usually made by the department; in only 20 cases did the donor make the selection. Thirty-one scholarships were granted as a result of competition.

About 90% of the awards were for one year. There were 21 two-year scholarships and 17 four-year scholarships. In one out of four cases the university also receives some manner of payment.

In looking ahead, the schools predict that of the 333 undergraduate scholarships available, 320 will probably be awarded again in the academic year 1961-62. A few new scholarships are anticipated.

Table 2. Number of Undergraduate and Graduate Scholarships Available at Various Schools

Number of Scholarships	Number of Colleges Awarding Scholarships	
	Undergraduate	Graduate
20 to 25	2	1
11 to 19	7	0
6 to 10	12	1
2 to 5	27	9
1	16	7
	64	18

Graduate Awards

It is interesting to note that only 59 graduate scholarships were awarded during the past year, but the total amount of funds involved surpassed that of the 333 undergraduate scholarships. The total value of the graduate awards is $178,050, making the average value $3000. The largest amount given was $5000 and there were several with this value.

While 64 schools award undergraduate scholarships, only 18 furnish aid to the graduate student. Here again, the spread in the number of scholarships varies considerably; seven schools give only one graduate scholarship and one school gives 20 (Table 2). Of the total granted, 49 are underwritten by industry, five by municipal funds, two by societies, and three by university funds. The payment is usually in a lump sum, combining tuition costs plus a cash stipend. The metallurgy department selects the recipient in 51 instances; some form of competition governs selection for the remaining eight.

Fifty graduate scholarships were for one year; one was for two years, and eight were indicated as other (presumably for the duration of graduate study within certain limitations). On the graduate level the university did much better in the matter of sharing funds, receiving some form of payment 87% of the time. When asked whether these scholarships are likely to be repeated in the succeeding year, 49

*Secretary, ASM Advisory Committee on Metallurgical Education

schools said yes.

The number of metallurgists graduating with a B.S. degree is now about 700. On the average then, one out of every eight receives some scholarship assistance, but $525 does not go very far in covering the present cost of a college education. However, on the graduate level, scholarships are more substantial and take care of a considerable portion of a student's expenses. In addition, the majority of graduate students receive support from other sources, such as teaching fellowships and research assistantships. Of the approximately 200 metallurgy students receiving advanced degrees annually, only a few pay their own expenses in full.

ASM members will be interested to know that of the 154 scholarships available from societies and foundations, about half originate from our Society—61 awards of $500 each from the ASM Foundation for Education and Research, and 14 from ASM chapters.

IMPORTANT MEETINGS

May 9-11—Material Handling Institute, Eastern States Show, Trade and Convention Center, Philadelphia. (Information from R. B. Woolery, P.O. Box 9562, Frankford Station, Philadelphia 24)

May 10-12—Society for Experimental Stress Analysis, Spring Program, Benjamin Franklin Hotel, Philadelphia. (Information from SESA, 21 Bridge Sq., Bridgeport, Conn.)

May 17-19 — Society for Nondestructive Testing, Eastern Regional Meeting, Mount Royal Hotel, Montreal, Canada. (Information from Maurice Daly, SNT, 2168 Addington St., Montreal 28)

May 17-19 — Metallurgical Society, American Institute of Mining, Metallurgical, and Petroleum Engineers, Conference on Management of Materials Research, Arden House, Harriman, N.Y. (Information from AIME, 29 W. 39th St., New York 18)

May 22-26—American Society of Tool and Manufacturing Engineers, Exposition, New York Coliseum. (Information from ASTME, 10700 Puritan, Detroit 38)

June 11-23—Pennsylvania State University, Course on Solid State Mechanics. (Information from Engineering Seminars, Conference Center, Pennsylvania State University, University Park)

June 12-23—Illinois Institute of Technology, Summer School in X-Ray Diffraction Analysis. (Information from Prof. L. V. Azaroff, Illinois Institute of Technology, Technology Center, Chicago 16, Ill.)

June 16-19—National Assoc. of Metal Finishers, Convention, Statler-Hilton Hotel, Boston. (Information from NAMF, 11 Park St., Montclair, N.J.)

June 19-23—Pennsylvania State University and American Carbon Committee, Fifth Biennial Conference on Carbon, Penn Sstate. (Information from D. S. Coleman, Conference Coordinator, Pennsylvania State University, University Park, Pa.)

Outstandingly Successful Meeting in New Mexico

By Ernest E. Thum
Director of Editorial Services ASM

Two hundred and fifty men, including a half dozen foreign experts (without counting vivacious Janet Briggs of Climax Molybdenum) met at Albuquerque, N. M., on Feb. 16 and 17 in a symposium on "Recent Developments in Materials for Nuclear Applications." As was true of a similar meeting in 1957 on "Metals for Supersonic Aircraft and Missiles," this was organized by the **Albuquerque** and **Los Alamos Chapters** ASM. Equally true was the resounding success of the enterprise—a tribute to the energetic organization committee, headed by A. W. Snyder, to the hospitable arrangements made by the University of New Mexico at its unexampled Student Union, and to the support of the principal organizations in the two localities, Sandia Corp., ACF Industries, Los Alamos Scientific Laboratory and the U.S. Air Force Base.

At the general opening session R. E. Schreiber of Los Alamos Laboratory and U. M. Staebler of the U.S. Atomic Energy Commission's Division of Reactor Development outlined the problems still being faced by designers and constructors of propulsion reactors for aircraft and space vehicles as well as the more conventional stationary and mobile power plants. The audience then split for simultaneous sessions on fuels and their fabrication and on radiation damage to structural elements, moderators and coolants. Finally, the group rejoined to hear a most penetrating analysis and hopeful forecast of what might be expected of commercial power plants a generation hence, presented by Alvin M. Weinberg, director of Oak Ridge National Laboratory.

Monograph Series on Metals in Nuclear Applications

At the request of the U.S. Atomic Energy Commission, the American Society for Metals is preparing a series of six monographs on materials and processes used in fabricating components of power reactors. Titles of the first four monographs are:

"Fabrication of Control Rods"
"Fabrication of Metallic Fuel Elements"
"Materials for Control Drive Mechanisms"
"Advanced Techniques in Powder Metallurgy"

The selection of titles and authors is being made by an ASM advisory committee who are authorities in the fields of reactor alloys, pressure vessels, welding and inspection, stainless steels and powder metallurgy. Committee members include Merrill A. Scheil, A. O. Smith Corp; H. H. Chiswik, Argonne National Laboratory; Herbert S. Kalisch, Olin Mathieson Steel Corp.; Robert C. McMaster, Ohio State University; C. Roger Sutton, International Nickel Co.; and R. D. Wylie, Babcock & Wilcox Co. Ernest E. Thum, ASM director of editorial services, will supervise the project.

Authors of the monograph series include William E. Ray, Dresser Products, Inc.; S. J. Paprocki, Battelle Memorial Institute; George A. Freund, Western Nuclear Corp.; and Frances Clark, Stephens Institute of Technology. This project, which will completely cover the field of metals, metal-like substances and metallurgical operations of importance to the utilization of nuclear energy for peaceful purposes, is to be used by the AEC as a model for four others under consideration in other branches of nuclear engineering.

Editorial Advancements in ASM Periodical Publication Area

John Parina, Carl Weymueller, Ralph Dermott and Elizabeth Aldrich have received new assignments in the ASM periodical publications editorial department as part of a staff realignment designed to further improve Society services to its 34,000 members.

Allan Ray Putnam, managing director, makes this statement to members: "I am pleased to announce the appointments of John Parina as editor of the new Metals Engineering and Transactions Quarterlies, and of Carl Weymueller, Ralph Dermott and Elizabeth Aldrich to new positions on *Metal Progress*".

"I join with Ernest E. Thum, director of editorial services, and Allen G. Gray, editor of periodical publications, in congratulating these four ASM staff associates upon their appointments. These are important steps in preparing the Society to meet the educational challenges it faces in the years ahead".

Carl Weymueller and Ralph Dermott have been advanced to associate editor and managing editor of *Metal Progress*. Both were formerly assistant editors of the magazine. Elizabeth Aldrich has had her title reversed, from editorial assistant to assistant editor. The appointments reflect the expanding needs of a member-readership that has increased in number by more than 3000 in the last two years.

Carl Weymueller, who joined the ASM staff in 1957, holds a B.S. degree in metallurgy from the University of Illinois. After graduation in 1949, he served as metallurgical engineer for Republic Steel Corp. in Chicago until 1957. After several months with Wyckoff Steel Co., he became assistant editor of *Metal Progress*.

As managing editor, Ralph Dermott succeeds Marjorie R. Hyslop, who has relinquished her *Metal Progress* duties to devote full time to being manager of the ASM Documentation Service. After graduating from Penn State University in 1956 with a B.S. degree in metallurgy, he joined the American Brake Shoe Co., Mahway, N.J., as assistant metallurgist and later as project engineer. He then became assistant research metallurgist at the Havens Laboratory of Bridgeport Brass Co., before joining *Metal Progress* in June 1959.

Elizabeth Aldrich came to the ASM staff in 1954, after concluding her studies at Oberlin College, Oberlin, Ohio. Since that time she has advanced from typist to secretary, editorial assistant, and she is now assistant editor. She also served as assistant corresponding secretary for the World Metallurgical Congress.

A ten-year veteran staff associate, John Parina started as associate editor of *Metal Progress*. He assumes his new duties as editor of both the Metals Engineering and Transactions Quarterlies while retaining the position of editor of technical books.

Toolsteel Performance as It Affects Production

That each user can noticeably improve tool and die performance was offered as a challenge to members at **Detroit** by Russel H. Boettger in a talk, "Heat Treatment of Toolsteels—Doing Things With Them You Never Did Before". Mr. Boettger is field metallurgist, assistant to vice-president-general sales manager, Columbia Tool Steel Co. The challenge was predicated on wise utilization of the latest technical advances coupled with engineering know-how to select, design, process and apply toolsteels in production.

R. H. Boettger, Columbia Tool Steel Co. and Technical Chairman Paul Sheils, U. S. Steel Corp. in Detroit

Premature tool failure often may be traced to either improper setup or residual tool stresses. Faulty setup leads to overloading from poor design, misalignment, lack of sharpness or a malfunctioning machine. Residual tool stresses are usually introduced during its preparation and can generally be relieved by a tempering operation. Such stresses are effected from machining, straightening, incomplete tempering after hardening and continual operation.

Recently developed metal removal processes were described. Electrical discharge machining, or the EDM process, can be used on fully hardened materials with tolerances as low as 0.0005 in. being held — far greater precision than afforded by conventional machining methods with as much as 25% increase in service life realized. Mentioned in the same light were electrolytic grinding and machining, as well as ultrasonic and electron beam machining.

In general, the smoother the finish of tools, the greater their life. Tool grinding marks should, if possible, be paralleled to the direction of material flow in service.

Welding and rehardening may be important aids to the tool and die maker. Welding must be considered a difficult process—use only as an expedient, observing appropriate precautions, including pre and postheating. Rehardening may be undertaken numerous times, contrary to the general belief, provided the tool is properly re-annealed and rehardened within the recommended temperature for the grade.

The relation of service life of tools to sound heat treating practice was discussed thoroughly. To obtain best results, advantage must be taken of latest information on time and temperature data for the grade, making proper allowances for effect of mass, observing effective quenching routines, selecting proper tempering time and temperature and using a furnace atmosphere that does not markedly affect surface chemistry. Utilization of low hardening and tempering temperatures was strongly stressed.

Mr. Boettger closed by enumerating "ten rules for good tools", reemphasizing the primary objective to make toolsteel tools and dies work well to achieve high performance in production. *(Reported by A. A. Conrad, Jr.)*

Special Stainless Steels

Recent developments in special stainless steels were reviewed by Adolph J. Lena, manager of the basic research department, Allegheny Ludlum Steel Corp., at a meeting of the **Penn State** Chapter.

Of the more than 100 stainless steels now produced commercially, approximately 40 have been standardized by the American Iron and Steel Institute. The others can be considered as special stainless steels and fall into two types: minor modifications of the common steels, or alloys whose metallurgical or corrosion behavior is substantially different from the ordinary steels.

Modified stainless steels are derived by changing slightly the ordinary steels to make them suitable for a specific application. Among these are a number of steels which are either low in carbon or contain columbium or titanium to prevent sensitization during welding. Several of these, such as Types 321, 347 and 304L are AISI grades whereas others are not. The resistance of Type 410 stainless to pitting corrosion can be improved by replacing some of the chromium with molybdenum. Also, with proper mill processing, the nonuniform deformation problems encountered with Type 430 can be virtually eliminated by adding small amounts of columbium.

Special stainless steels are also intended for specific applications but differ more from the ordinary steels than do the modified types. They include the precipitation hardening stainless steels, copper-bearing austenitic steels for improved corrosion resistance and high-nickel steels for improved oxidation resistance.

The properties of the precipitation hardening steels are determined by their structures. One type is martensitic as-solution annealed and as-aged. Steels of this type have yield strengths of approximately 180,000 psi. A second type of precipitation hardening steel is austenitic as-solution annealed and martensitic as-aged. While in the austenitic condition it will have good formability and, after heat treatment, the yield strength will be in the 160,000 to 200,000 psi. range. Steel of this type is being used in high-speed aircraft. A combination of high yield strength and low permeability is possible with a steel which is austenitic as-solution annealed and as-aged. A fourth type of precipitation hardening stainless exhibits a duplex austenitic-ferritic structure. This type is used particularly to increase corrosion resistance in cast forms.

The corrosion resistance of austenitic steels can be improved greatly by additions of copper and molybdenum. The corrosion rate in sulphuric acid is much lower than if no copper is present.

Finally, certain special steels have been developed for improved oxidation resistance at elevated temperatures. Among these is a 15% Cr-35% Ni steel which is free from sigma formation and is capable of being used up to 1800°F. *(Reported by George Sabol)*

A PANEL OF EXPERTS *answered questions on tool and stainless steel, die making and die design, lubrication of metals, welding of metals and metal plating asked by members of the Western Ontario Chapter at a "Stump the Experts" session. Panel members were, from left: Alex Stuart, Walter Kosh, Norm Eley, Bob Stewart, moderator, Dick Waddington and Harold Brennenstuhl*

Refractory Metals and High-Temperature Alloys

During the last ten years there has been an ever-increasing demand for high-temperature materials for use in gas turbine engines, space vehicles, chemical and petroleum equipment and in nuclear applications. As a result of this demand, there are now a number of new high-temperature alloys, a better comprehension of the problems associated with high temperature and an understanding of a few of the fundamental principles applicable to high-temperature alloy development. A discussion of some of these alloys, problems and principles was presented in a talk by R. W. Fountain, Union Carbide Metals Co., who spoke before the **Wilmington** Chapter on "Refractory Metals and High-Temperature Alloys".

The requirements that a high-temperature alloy should possess, according to the speaker, include strength at service temperature, oxidation resistance during use and fabrication (or capability for being coated), formability, both primary and secondary, and availability at an economical price. These requirements place a tremendous challenge on the alloy designer and, for this reason, it was suggested that improvement of existing alloys should not be overlooked. By tracing the development of the nickel-base alloys from 1938 to the present, Dr. Fountain showed how successful this philosophy can be.

The refractory metals for use above 2300° F. (Ta, Cb, Mo, and W) were compared on the basis of their mechanical and physical properties, oxidation resistance and applicability to a number of end uses. Molybdenum and tungsten and their alloys, because of their superior strength properties, are most widely used. Columbium and its alloys, because of a favorable strength-weight ratio and relatively better oxidation resistance, are finding increased acceptance in the temperature range between 1700-2300° F. The progress in the development of high strength in these materials has thus far outstripped the rate of development of oxidation resistance and of coatings. *(Reported by G. D. Smith)*

New Tool for Science and Industry

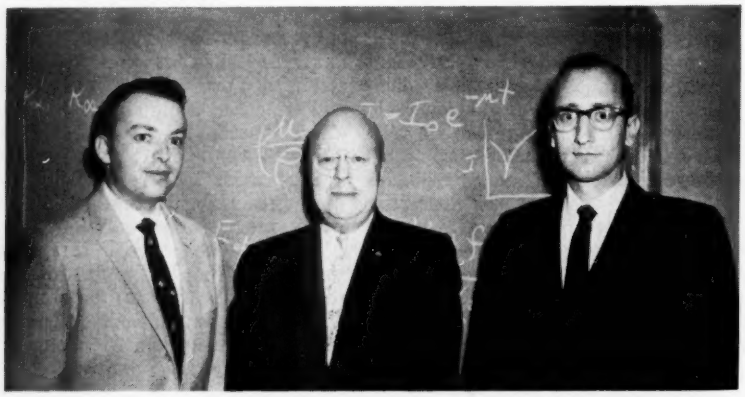
Despite the fact that six Nobel prizes have been awarded for work relating to X-rays during the 66 years since their discovery by Roentgen, the subject is still far from being exhausted. A report of current developments of the new and promising uses of beta-excited X-rays was presented by Ralph H. Muller, a pioneer and recognized world authority in that field, at a **Los Alamos** meeting.

It has been known for years that X-rays are generated when beta particles interact with matter. Only within the last four or five years, however, has systematic research been directed toward practical application of the X-rays thus generated. Consequently, the subject is too new to permit making an exhaustive evaluation of its advantages and limitations. Advantages in speed, economy and convenience over the use of conventional X-rays seem assured, not only in metallurgy but in several other applications as well.

The basic apparatus used by Dr. Muller consists of a source of beta particles to irradiate the sample and a suitable detector to analyze the resulting X-rays. A number of applicable beta-emitting isotope sources are available at costs as low as a small fraction of a dollar. The sample may be a wafer of solid materials or it may be a fluid within a containing cell. The output of a scintillation device activated by the beta-excited X-rays from the sample is analyzed in an automatically adjusted single-channel spectrometer. Use of a multi-channel pulse-height spectrometer is not required because the inherent stability of the source permits analysis of the X-ray spectrum by "scanning" with a single gate whose upper and lower cut-off values are known. The final unit of the apparatus is a conventional recorder, which yields a chart of X-ray intensity versus energy level.

Dr. Muller pointed out the following advantages of using beta-excited X-rays: beta emitting sources are readily available at costs of only a few pennies; either characteristic or general (white) X-rays may be produced; beta sources are small and readily portable, weighing only a few ounces complete with shielding; the apparatus is safe to store and operate; materials having a wide range of atomic numbers may be employed; stable operation is assured by the statistical uniformity of nuclear activity in the beta source; and over-all cost of the apparatus amounts to only 1/5 to 1/20 that of conventional X-ray apparatus. *(Reported by J. R. Morgan)*

David T. Eash, technical chairman, Ralph H. Miller, who spoke on "Beta-Excited" X-Rays, and R. D. Reiswig, chairman, during a pause at the Los Alamos Chapter



A Backward Look At Research

Paul D. Ffield, assistant manager of research, Bethlehem Steel Co., speaking before more than 100 members of the **Lehigh Valley** Chapter on Stoughton Award Night, explored the subject, "A Backward Look at Research", the theme of which was the answer to the question, "Is it worthwhile?". Drawing from his experience at the Goodyear-Zeppelin Corp., Mr. Ffield discussed, in the light of research, various design features and material requirements of such airships as the Akron and the Macon. Among the material developments he described the introduction and use of duralumin for structural members of the early German Zeppelin airships and the early use of 0.15% C, 18-8 stainless for exhaust pipes for Zeppelin engines, the consequent corrosion problems and the subsequent solution by using Ti-stabilized low carbon 18-8.

He told of some early development work on strain gages for the thin aluminum sections and described several ingenious optical devices for determining stress, strain and deflection of the large craft.

Drawing a parallel with the present space program, he pointed out that despite the fact that the Zeppelins were born of military necessity, there was considerable consternation concerning the $6,000,000 spent on their development in the United States. However, many lessons learned on the rigid airship program aided considerably the development of the airplane and airplane materials. Even the untimely demise of the Akron and Macon contributed to the state of knowledge of airship design.

In conclusion, Mr. Ffield stated that research properly carried out is worthwhile even if it does not achieve its basic aim, and undoubtedly the space research of today will yield favorable results parallel with those of the Zeppelin research of years ago. *(Reported by B. J. Fischer)*

Hot Extrusion Of Steel

A complete outline of all aspects of the extrusion process as practiced at H. M. Harper Co. was given by Kenneth G. Hookanson, director of research and development, at a **Chicago** Chapter meeting.

Mr. Hookanson presented a brief history on the development of the extrusion process, noting that articles like lead pipes were produced by the close of the 18th Century. However, considerable time passed before technological developments permitted commercial extrusion of the higher melting point metals—brasses at about the turn of the last century and aluminum, the current volume leader, even more recently. Steel extrusions, though first produced about 65 years ago, did not become commercially competitive until the comparatively recent process developments of Jacques Sejournet were made known.

Starting with billet manufacture and preparation, various aspects

ot the manufacture, cleaning and straightening of extruded bar were covered. Processing at Harper includes the latest innovations (some of which were developed there) and is a highly efficient and satisfactory means of hot shaping a wide variety of materials and sections. Billets, most of which are cast in the plant, are peeled to specific sizes and heated by induction in an inert atmosphere. A typical heating time for the latter operation is 3-5 min. and, with multiple stations, it is possible to reduce approximately 45 billets per hr. Temperature is controlled within close limits. The billets are coated with a glass powder or cloth which serves as insulator, lubricant and protection against oxidation. The character of the glass is varied with the material being processed.

The coated and heated billet is placed in a large press which effects considerable reductions in a single stroke. The metal may emerge from the shaping die at speeds up to 50 ft. per sec. Die design and die construction were also discussed, as well as the character of flow and relationship between press pressure, reduction ratio, resistance to deformation and die constants. (*Reported by W. L. Meinhart*)

Recent Developments in Production Heat Treating

The importance of atmosphere circulation in a furnace, with particular reference to carburizing operations, involving dense loading conditions where the process gas must get to the work in predetermined amounts, keeping the wind to a pre-established specification, was pointed out by J. E. Tripp, metallurgical engineer, research and development department, Surface Combustion Div., Midland-Ross Corp., at a **Peoria** meeting. Circulation is also used to carry heat to or away from the work load.

With the developments in furnaces, fan circulation systems, etc., it is not at all uncommon today to have carbon concentration control of ± 0.5 C, even in closely spaced work loads. Much attention is directed toward fan design and location to make the control of carbon concentration more effective.

Quenching techniques, using hot oil, for obtaining hardness with a minimum of distortion while maintaining maximum fatigue life, were reviewed. Reference was made to critical cooling rate, size and shape of piece parts, allowable change in part and the life of quench medium.

A short discussion on high-temperature carburizing followed and a chart showing comparisons of carburizing temperatures versus depth was presented. The operational economics of the various temperatures were pointed out for comparison. (*Reported by T. P. Cody.*)

Sonic Testing in the Steel Industry

Speaking before the **Los Angeles** Chapter **ASM** and Society for Nondestructive Testing, Gordon Meldrum, assistant chief metallurgist, Central Alloy District, Republic Steel Corp., related the progress of quality control in steelmaking, from 1905 when the Association of Licensed Automobile Manufacturers issued their Bulletin No. 9 to cover six chemical compositions, through the period of transverse fracture and macro-etch tests on down to the use of sonic test equipment early in 1945.

Proper ultrasonic test procedures now indicate defects associated with top center segregation or "pipe", laminations, rupture or cracks associated with heating and rolling and cracks incurred in the cooling of large sections.

Discards had been increased from the top and bottom of the rolled ingot to improve the product. Arbitrary percents below the hot top junction and above the ingot butt were set up in many cases to insure removal of segregation.

Republic now uses ultrasonic testing in high-quality alloy steels to determine the exact depth of top center segregation. The ingot is rolled or forged, allowing some normal top discard to remain. The steel is then ultrasonic tested to determine the exact depth of the pipe and required discard removal. This has been found to be an economical and satisfactory practice.

Several specifications have been written incorporating ultrasonic test requirements. These have, in most instances, been developed by the aircraft companies or their suppliers. However, a long experience in metallurgical testing makes a steel manufacturer cautious in acceptance of specifications which may provide a false sense of security.

Ultrasonic indications may be reduced, eliminated or developed in hot working, or they may be developed in subsequent operations associated with cold working, heat treating or drastic machining.

Probably the most trouble between steel producer and consumer in the ultrasonic rejection of finished parts has been related to porosity or insufficient hot working. The center of a 10-in. square should not be expected to be as sound as the center of a 5-in. square when produced from the same size ingot.

Ultrasonic test specifications should be developed as required for the finished part. Considerable experience and investigation would be required to relate these standards back to specifications suitable for steel mill control. Cooperation of the steel producer, fabricator and all involved is absolutely essential.

W. C. Harmon, head of Republic's Nondestructive Testing Division, added extensively to the story of sonic testing of steel. He presented slides showing developments of ultrasonic instruments and techniques, starting with the Reflectoscope, Model SRO4, introduced by Sperry Products Inc., and put in service by Republic in 1945.

The instrument, designated as Model L, designed by Republic was built in 1948. This equipment had a spiral time base up to 30 in. long on a small cathode ray tube. Since it was small and light, there was a stronger incentive to perform ultrasonic testing with it. It, along with models introduced later, were all suitable for pulse echo testing of the direct contact type. The first transducers were primitive, flat-straight beam units. Soon after acceptance of ultrasonic testing in the steel plant, angle-beam crystal transducer units were introduced.

The use of pulse echo technique without direct contact was then described. The Immerscope was developed by Don Erdman and his company, Electrocircuits Inc. The ultrasound is transmitted from the transducer through a liquid (usually water) into the test piece in this equipment. The advantages of the immersion method were mentioned and a discussion of other crystals for transducers followed.

A set-up used for production testing of electrically welded large diameter pipe at Republic's Youngstown mill was illustrated and described, including automatic equipment now being used. (*Reported by Ira S. Young*)

McFarland Award Announced

The **Penn State** Chapter has announced that George H. Todd, assistant manager, Ashland Works, Armco Steel Corp., has been selected to receive the 1961 David Ford McFarland Award for Achievement in Metallurgy. Mr. Todd will receive the award at a dinner meeting on May 6, 1961, at University Park, Pa. After the dinner, he will deliver a technical address entitled "Metallurgy and Management."

The award was established in 1949 by the Penn State Chapter as an annual recognition to a metallurgy alumnus of the Pennsylvania State University. Mr. Todd's selection was based on his success in the metals industry and upon his record as a citizen.

Born in Valley Forge, Pa., Mr. Todd received his early education and training in the public schools of Norristown, Pa. A student under David Ford McFarland, to whose memory the award is ascribed, he received the B.S. degree in metallurgy at Penn State in 1928. While in college, he was recruited by Armco Steel Corp. and assigned to its Ashland Works in Kentucky as the result of his expressed desire to follow the openhearth phase of steel plant operations. Starting as a laborer and subsequently a furnace helper in the openhearth, he advanced through numerous positions to his present capacity as assistant manager of the Ashland Works.

As a member of the AIME and AISI, Mr. Todd has participated in programs and presented technical papers before both societies. He has traveled in the Ruhr Valley of West Germany and Sweden on behalf of his company's interest in metallurgical processes. He is the assigner and co-assigner of several patents pertaining to the openhearth process. He is a member at the present time of the Blast Furnace Committee of Reserve Mining Co., a joint enterprise of Armco and Republic Steel in the production of pellets from Minnesota taconite ores.

As an outstanding citizen of Boyd and Greenup Counties, Ky., Mr. Todd has served as chairman of the local Red Cross, president of the Community Chest and a director of the Rotary Club. He is a life member of the Penn State Alumni Association, a member of the Valley Forge Historical Society and the Newcomen Society.

Friends of the Penn State Chapter of ASM and of Mr. Todd are invited to make reservations for the dinner at Nittany Lion Inn before May 1 with Prof. R. W. Lindsay, Mineral Sciences Building, Pennsylvania State University, University Park, Pa.

Conversion of Radiation Into Electrical Energy

Materials research on the direct conversion of radiation into electrical energy by thermo-electric, thermionic and photovoltaic techniques was discussed by Fred D. Rosi, head, Semiconductor and Metals Research Group, RCA Laboratories, at a **Washington** Chapter meeting. The application of thermoelectricity to power generation and a description of research on semiconductors for operation in the 25-700° C. temperature range were emphasized.

Dr. Rosi pointed out why semiconductors are the most promising materials for thermo-electric operation up to 700° C. and why this temperature range coincides with potential heat sources, such as focused solar and nuclear energy.

General considerations of efficiency factors leading to materials selection, evaluation of new compound semiconductors and their solid solution alloys and the fabrication of power generating thermocouples with these new materials were described. For the 25-250° C. temperature range, the most promising materials are solid solution alloys of $BiTe_2$ with $BiSe_3$ and $SbTe_3$; and for the 250-525° C. range, solid solution alloys of $AgSbTe_2$ with the IV-VI compounds such as PbTe, GeTe and SnTe. With these materials, thermo-electric power generating efficiencies of 11-12% were realized on operation over the 25-525° C. temperature range. Although considerable data has been published in recent years on both the materials and device aspects of thermo-electric power generation, this progress represents only the early stages of technological development.

Dr. Rosi pointed out that a strong need still exists for additional exploratory research for new and better materials, a better understanding of transport phenomena in insulators, semiconductors and semimetals at high temperatures, and a demonstration of the feasibility of power generating efficiency competitive with conventional converters.

In the description on direct energy conversion by photovoltaic means, attention was given to considerations of the optimum semiconductor materials for solar energy conversion. Experimental results were presented which showed operating characteristics and conversion efficiencies of a number of materials including silicon and gallium arsenide. A description was also given of the major problems still to be solved for attaining theoretically predicted efficiencies, including making suitable ohmic contacts to the n and p-type regions of the solar converter to increase the output voltage and current, the need for low resistivity in the p and n-type regions to obtain the maximum voltage per junction and a low series resistance and the role of crystal imperfections on p-n junction behavior.

The principle of energy conversion by thermionic means was presented by drawing a direct analogue with thermo-electric energy conversion. The operational charteristics of thermionic diodes were analyzed, and the means for achieving high conversion efficiency outlined. Emphasis was placed on the difference between the work function of the cathode and anode to take advantage of the contact difference of potential and the space charge effects in the interelectrode space. Thermionic converters which have already provided an efficiency of 10% using a tungsten cathode, a nickel anode and cesium vapor to overcome space charge effects were described. For improving the life of such high-temperature converters, attention was also given to the use of barium-impregnated tungsten cathodes and a third electrode to ionize the cesium vapor. *(Reported by R. M. Gustafson)*

MEN in METALS

Del S. Harder, retired Ford Motor Co. vice-president, has been elected a director of Aluminum Industries, Inc.

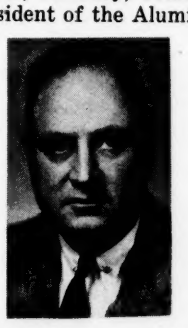
Albert S. Parmelee has been appointed a representative in the Detroit Div., Solar Steel Corp., for the sale of hot and cold rolled sheet and strip steel in Western Michigan. Edward A. Spooner has been made a sales representative for Solar in Virginia and North Carolina.

Bert F. Prentiss has been promoted from assistant to chief inspector of the Mishawaka Div., Bendix Corp. He will supervise missile early test inspection, the missile quality laboratory and the inspection department.

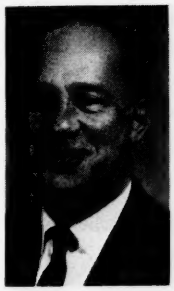
New vice-president in charge of sales for National Twist Drill and Tool Co., Rochester, Mich., is William E. Atchley, former sales manager. Fred D. Lamb, Jr., former assistant general sales manager, has been made general sales manager.

Charles J. Brown has been named to the newly created position of executive vice-president of Jones & Laughlin Steel Corp.'s Stainless and Strip Div. He has been vice-president of Freeport Nickel Co.

John W. Douglas, president of Republic Foil Inc., Danbury, Conn., was elected president of the Aluminum Association during the anual meeting held on Feb. 17. Mr. Douglas founded Republic Foil, a company which produces high-quality aluminum foil, in 1945. He served this past year as vice-president of the Aluminum Association and is currently a member of the Prime Aluminum Products Industry Advisory Committee of the Department of Commerce.



Ragnar Carlstedt, designer of tools and metalworking machines, has become associated with Kennametal Inc. to develop specialized applications of carbide tooling. A native of Sweden, Mr. Carlstedt for some years headed a Stockholm firm which manufactured machine tools, measuring instruments, tools and dies. Following his arrival in this country in 1956 he worked with the R. K. LeBlond Machine Tool Co. More recently he served as director of engineering and development work for the Peter J. Salmon Co., Philadelphia. He attended the Royal Institute of Technology in Stockholm and is a graduate of the Technical University of Berlin.



H. D. Kinsey has been elected a vice-president of Union Carbide Corp. and Paul L. Alspaugh president of Union Carbide Olefins Co. Mr. Kinsey joined the company in 1924 and since 1957 has been president of Union Carbide Olefins Co. Mr. Alspaugh started in 1928 and was formerly vice-president of Olefins Co.

Edward W. Guion has been appointed assistant manager of fabricated products for Quaker State Metals Co. He has been associated with the firm since his graduation from Penn State University in 1956.

James Fritz has been appointed steel plant metallurgist in the Colorado Fuel and Iron Corp.'s Buffalo metallurgical department. He was formerly process metallurgist at the Claymont plant.

Henry L. Burghoff has been appointed a director of research and development for Chase Brass & Copper Co. He replaces D. K. Crampton who is retiring after more than 44 years of service with the company.

Rex F. Supernaw has been named chief metallurgist for National Twist Drill and Tool Co. He joined the company in 1935.

Thomas H. Ginsburg has been appointed vice-president-plant manager and Alfred S. Dubinsky vice-president-raw material purchasing, by Alloys and Chemicals Corp. Mr. Ginsburg was formerly plant manager, Mr. Dubinsky director of purchases.

D. A. (Bud) Atwater and Robert C. Grund have been named assistant managers of Republic Steel Corp.'s Alloy Sales Div. in Massillon, Ohio. Mr. Atwater joined Republic's Alloy Sales Div. in 1934 and has worked on administrative problems concerning stainless steel. Mr. Grund has been with the division since 1947 and has been a sales representative in Detroit since 1954.

Edward C. Bayer has been appointed technical director of Holcroft & Co., Detroit. He joined the company in 1946 as a metallurgist.

Franklin B. Rote has been appointed director of research and development of Mueller Brass Co., Port Huron, Mich. Dr. Rote, who holds B.S., M.S. and Ph.D. degrees from the University of Michigan, began his metallurgical career in the research and development laboratory of International Nickel Co. working on development and improvement of high-strength and stain resistant cast irons. During early World War II he joined the Engineering Research Institute at University of Michigan as a research associate in the development of highly alloyed wrought and cast materials for gas turbines and jet engines. Later in the war he worked on forging practice for magnesium alloys for Wyman-Gordon Co. He returned to University of Michigan where he remained until he joined the Albion Malleable Iron Co. He joined Mueller Brass in February 1961. Dr. Rote has been active as a contributor to the ASM Handbook, having worked on the magnesium forging section of the 1948 edition and the malleable iron section of the new edition just out.

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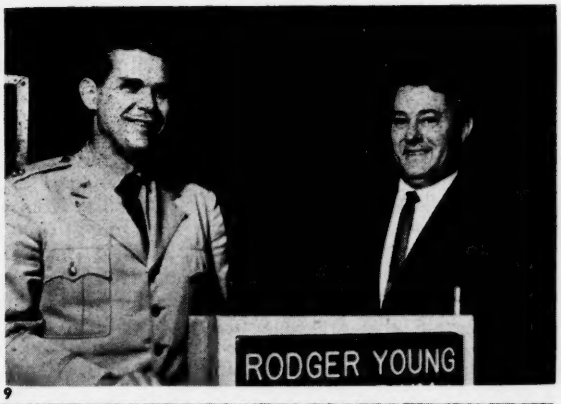

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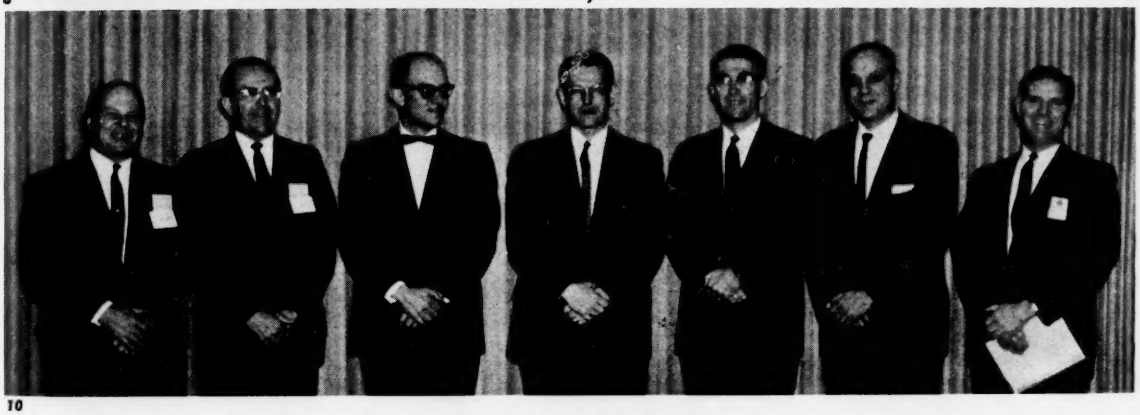

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1. ASM President William A. Pennington spoke on "Diffusion and Transport of Carbon in Ferrous Metals" at Chicago. From left: T. C. DuMond, C. E. Swartz, Dr. Pennington, M. E. Scheil and C. H. Samans. 2. Edward C. Varnum, head, operations research, Barber-Colman Co., spoke on "Use of Computers in Stress Analysis" at Rockford. 3. A group of Worcester men examine the Do-All Co. exhibit on "The Story of the Cutting Edge". 4. Richard Raring, Washington chairman, presents an ASM scholarship award to Thomas G. McWilliams, faculty member from the University of Maryland, in behalf of Bernard A. Simmons, senior metallurgy student, who was unable to attend. 5. Past President ASM Walter Crafts, who spoke on "Facing the Productivity Challenge" at Louisville, is shown with C. C. Jenkins. 6. President W. A. Pennington, left, guest at Ottawa Valley, is shown with chairman Neville Spence and coffee speaker G. C. Monture. 7. Charter members of the Oregon State College Chapter include, back row, from left: Jack Nemchick, Nelson Van Kleeck, George Fisher, chairman, Moress Kurtz, Larry Carson, Karl Peterson and O. G. Paasche, advisor; front, from left: Len Elliott, Bill Porter, Ratan Golvila, Bob Yunker, secretary-treasurer, Gordon Hull, vice-chairman, and Bob Gifford. 8. J. A. Luker, chairman, department of chemical engineering and metallurgy at Syracuse University, presents an ASM scholarship certificate to Henry Thomas, senior metallurgy student. 9. Lt. Col. John F. Clyde, chief, Support Engineering Div., Directorate of Advanced Research and Development, Air Force Ballistic Missile Div., who spoke on "Materials in Space—Present and Future" at a meeting in Los Angeles, is shown with A. L. Collins, technical chairman. 10. A panel on "Wear" at the West Michigan Chapter included, from left: Claude C. Dierdorf, vice-chairman; Richard F. Haskins, chairman; William A. Glaeser, moderator; Robert L. Johnson, NASA; Donald F. Hays, General Motors Corp.; Lyle E. Fuller, Linde Co.; and William A. McLaurin, chairman, local SAE chapter. 11. Clarence R. Smith, Convair, spoke on "Fatigue and Aeronautical Structures" at Philadelphia.

11

RESEARCH
R & D NEWS
DEVELOPMENT

Molybdenum Single Crystals

The Wah Chang Corp. is producing high-purity single crystals of molybdenum up to 3 in. in diameter by 18 in. long and weighing up to 7½ lb. Larger crystals of "moly", tungsten, and other metals can be grown. High plasticity is demonstrated by the success in rolling moly crystal bar to sheets 3 in. wide

by 12 in. long by 0.050 in. thick. Capable of being further reduced to 0.010 in. thick, this sheet will be used in X-ray, recrystallization, transition temperature and anisotropic studies. The high-purity of the material—interstitial level below 40 ppm.—is obtained by quadruple electron beam melting.

For further information write to Wah Chang Corp., P. O. Box 366, Albany, Ore.

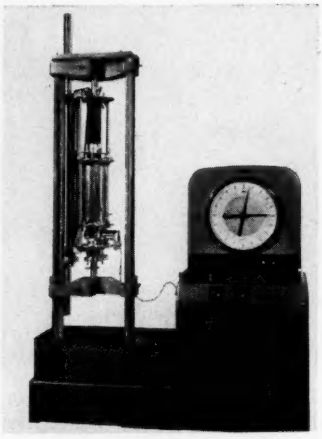
Cineradiographs of High-Speed Phenomena

A pulsed X-ray system, which generates short pulses of high-intensity X-rays at high repetition rates, can be applied to studies of shock and vibration, rocketry and ballistics, radiation effects and crystallography. With a life in excess of one million shots, the thermionic hot cathode tube exhibits good reproducibility of pulse length, voltage, current and X-ray output characteristics.

The pulsed system consists of two units: the X-ray console (generating tube, power supply and controls) and the image intensifier console. The X-ray tube is pulsed with a square-wave voltage pulse, 1 microsec. long and pulse rate can vary from 1 to 30 per sec. Tube voltage amplitude is variable from 0 to 150 kv. When the tube is operated at 150 kv. with a beam current of 130 amp., X-rays are generated by a 20-megawatt electron beam focused on the conversion target. Resulting high-intensity X-rays have an effective spot size of 1 by 2 mm. and, at 1 in. from the target, have an intensity rate of 10^7 roentgens per sec.

A bullet from a high-power rifle, traveling at 4000 ft. per sec., can be "stopped" in flight by this system, and its image projected on the screen of a closed-circuit TV receiver for group observation.

For further information, write to Zenith Radio Corp., 6001 W. Dickens Ave., Chicago 39, Ill.



HOT CELL TENSILE TESTING—*With minor modifications to the furnace arrangement in a two-unit set-up, this hydraulic machine can be used for determining strength properties of plutonium in a hot cell installation. The electric furnace produces temperatures to 5000° F. A special arrangement permits specimen loading by manipulators. For additional details, contact Riehle Testing Machines Div., E. Moline, Ill.*

Automatic Sample Changer

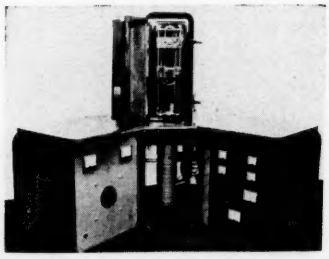
This unit can handle up to 30 solid radioactive samples and may be used for automatic absorption curve measurements. The changer holds planchet samples up to 30 mm. in diameter and either 3 mm. or 8 mm. high. It operates in conjunction with a proportional flow counter, Geiger tubes or alpha, beta and gamma scintillation detectors.

Two different data printing systems can be used—a count-and-time printer and a less-expensive printing timer. The count-and-time printer records up to 999,999 radioactivity counts and up to 999.99 min. and prints this information alongside the sample number. The printing timer records the time required to reach a pre-set amount of radioactivity.

For further information, write to Picker X-Ray Corp., 25 S. Broadway, White Plains, N.Y.

Zone Refining by Electron Beam

Temperatures as high as 6000° F. can be generated by electron beam bombardment in the "Model EBZ-



93" floating-zone refining apparatus. The unit can be used to purify and grow single crystals of refractory metals and compounds and for vapor deposition of high-melting point metals. The tungsten emitter, enclosed in a beam-focusing scanner, quickly produces a thin string of molten metal in the specimen. An automatic program drive allows the scanner to pass up and down the specimen as many times as required and at any pre-set speed. Impurities are vaporized or concentrated at either end of the bar. The vacuum system includes a 6-in. diffusion pump (720 liter per sec.), a 6-in. gate valve, and a liquid nitrogen vapor trap.

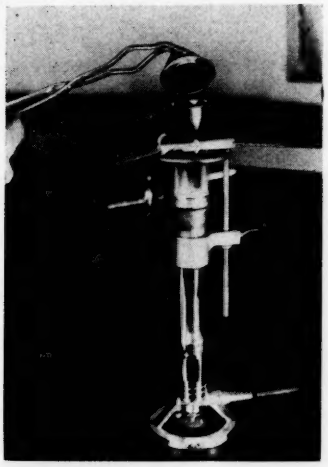
For further information, write to MRC Mfg. Corp., 47 Buena Vista Ave., Yonkers, N.Y.

Zirconium Labware

Where laboratory budgets are a problem, zirconium ware (at 1/6 the price of platinum ware) may be worth considering. With normal care, zirconium crucibles are good for at least 100 sodium peroxide fusions at 460° C. (860° F.). They can be used at temperatures up to 900° C. (1650° F.) for sodium and potassium carbonate fusions, preferably in the reducing atmosphere of a burner flame rather than in a furnace.

Nickel, iron or porcelain crucibles always present the problem of sam-

ple contamination. With zirconium, however, after 20 to 50 peroxide fusions only 0.1% per fusion is lost



and all traces of zirconium are easily removed in the subsequent analysis.

For further information, write to Fisher Scientific Co., 717 Forbes Ave., Pittsburgh 19, Pa.

Force Transducer

The "Series TT" force transducer is a fast-response primary element for continuous measurement and control of varying amplitude forces —tension, pressure, weight or thrust. A system of cross-spring (flexure) pivots, combined with a flat cantilever mainspring, is used in this mechanical-to-electrical

transducer. The flexure pivots prevent any movement of the load platform in crosswise or lengthwise planes, but allow bending in a third plane. The heavy flat cantilever spring and flexure pivots permit direct mounting of the load on the Force Transducer.

Standard models can handle loads from 8 oz. to 1500 lb. Special designs are available for loads up to 50,000 lb. Overloading will not damage units or cause a shift in calibration.

For further information, write to Hydro-Pneu-Tronics, Inc., 3666 E. 116 St., Cleveland 5, Ohio.

CHAPTER BRIEFS

• W. R. Moggridge, manager of quality control, Canadian Iron Foundries, in a talk on the "History of Foundry Practices" at **Western Ontario,** covered the period when the pouring of metals had just begun and proceeded up to the time that crude sand molds were being made and were poured with cast iron. When a foundry was making a cast iron pipe poured in an open mold standing on end, the ratio was two bad castings to one good one. The foundry would turn out about two pipes per day due to the poor sand and casting material of that day.

• The reasons why vacuum degassing of steel has become such an important metallurgical process in the past three years were outlined by Michael V. Herasimchuk, metallurgical supervisor, Bethlehem Steel Co., at a **Columbia Basin** meeting. He stated that the future calls for more intensive application of degassing techniques and the metallurgist must remain mindful of the capabilities and limitations of today's art.

• In a talk at **Syracuse,** National Trustee John Convey, director, Dept. of Mines and Technical Surveys, Mines Branch, Ottawa, gave the definition of a metal from both an applied and a theoretical standpoint.

• The advantages of using induction heating rather than flame hardening or conventional heat treating were discussed by H. B. Osborn, Jr., district manager, Ohio Crankshaft Co., at **Syracuse.** Currently induction hardening fixtures are being built to hardening and hold even small diameter parts to tolerances of but a few thousandths, thus eliminating costly straightening operations.

• The various types of corrosion which copper and copper alloys resist and how corrosion is combatted by the proper selection of materials were covered in a talk by V. F. Nole, Chase Brass and Copper Co., at a meeting in **Richmond.**

• Throughout the industry considerable effort is being devoted toward the development of a commercially competitive automotive gas turbine engine. The gas turbine holds very definite promise for the future and there are applications where it would be competitive today, according to J. D. Peebles, Allison Div., General Motors Corp., who spoke in **New York.**

• The history of magnesium, its initial development and first application by Dow Chemical Co. were reviewed at a **Jacksonville** meeting by R. S. Olson, sales engineer, Dow Metal Products Co.

• George Dahm, Linde Co., presented a talk on the "Usage and Safe Handling of Welding Gases" at **Terre Haute.** He illustrated his talk with slides and motion pictures which demonstrated what happens under dangerous handling conditions.

• The keynote of successfully dealing with the customer problems in today's markets is a complete liaison between service, laboratory and mill metallurgists. The increased duties and responsibilities of technical personnel in the steel mill, together with the changes in the last few years which require a more advanced comprehension of metallurgy by production superintendents were discussed by A. F. Mohri, chief metallurgist, Steel Co. of Canada Ltd., at an **Ontario** meeting.

METALLOGRAPHIC WINNER —*At a special ceremony before the Boston Chapter, Stephen A. Oliver, a student at Massachusetts Institute of Technology, is presented his honorable mention award in ASM's 1960 metallographic competition. The presentation is made by Marc Richman, MIT student representative*

CHAPTER MEETING CALENDAR

Albuquerque	**May 18**	Hoyts Dinner Bell	**Roy E. Paine**	Aluminum Alloys
Atlanta	**May 8**			Metal Forming Practices and Techniques
Baltimore	**May 15**		**J. Pearson**	Explosive Forming
Birmingham	**May 2**		**Al Fairchild**	National Officers Night
British Columbia	**May 11**			Golf Tournament
Buffalo	**May 25**	South Shores Country Club		Annual Meeting—Golf Party
Calumet	**May 9**	Phil Smidt Restaurant	**T. J. Dolan**	Fatigue and Fracture of Metals
Carolinas	**May 18**	Asheboro Country Club	**W. A. Pennington**	National Officers Night
Cedar Rapids	**May 8**	Davenport		Alcoa Plant Tour
Chicago	**May**			Ladies Night
Chicago-Western	**May**	Old Spinning Wheel		Ladies Night
Cincinnati	**May 23**	Elks Country Club		Annual Meeting and Outing
Cleveland	**May 1**	Engineering & Scientific Center	**G. Mervin**	Materials, Key to Space Flight
Columbus	**May 3**	Lincoln Lodge	**L. W. Coffin, Jr.**	Fatigue of Metals
Dayton	**May 25**	Walnut Grove Country Club		Annual Outing and Business Meeting
Delaware Valley	**May 17**	Hotel Stacey-Trent	**Harry M. Kessler**	Foundry Practice
Detroit	**May 8**			Old Timers Night
Eastern New York	**May 9**			Ladies Night
Fort Wayne	**May**			Spring Golf Outing
Golden Gate	**May 17**	Pittsburg, Calif.		Columbia-Geneva Steel Corp. Plant Tour
Hartford	**May 9**			Plant Tour
Indianapolis	**May 15**	Turners Club	**C. A. Wert**	Diffusion in Materials
Kansas City	**May**			Annual Spring Dinner-Dance
Los Angeles	**May 25**	Rodger Young Auditorium	**Albert A. Sikula**	Formability of Zinc Alloys
Mahoning Valley	**May 9**	Mural Room	**Morris Cohen**	Hardening of Steel
Milwaukee	**May 10**	Janesville, Wis.		Chevrolet and Parker Pen Co. Tours
Minnesota	**May 22**	Stillwater Country Club		Annual Golf Party
Mohawk Valley	**May 8**	Rochester, N.Y.		Eastman Kodak Co. Plant Visit
Montreal	**May 1**	Queen Elizabeth Hotel	**Panel**	The Canadian Metallurgist
Muncie	**May 9**	Ball State Student Center	**Norman O. Kates**	Minimizing Heat Treating Distortion
New Hampshire	**May 12**	Portsmouth, N.H.		National Officers Night
New Haven	**May 18**	Waverly Inn	**Austin R. Zender**	Economical and Political Factors in Our Economy
New Jersey	**May 15**	Essex House	**F. S. Feldheim**	Customs of the Mava Indians
New York	**May 8**	Brass Rail	**W. A. Pennington**	Diffusion and Transport of Carbon in Ferrous Alloys
North Texas	**May 4**		**Harry Strauss**	Fascinating Facts About Diamonds
N.E. Pennsylvania	**May 11**	Foot Hills Manor	**H. O. Walp**	Metallurgy of Ball and Roller Bearings
Notre Dame	**May 10**			Ladies Night
Oak Ridge	**May 17**		**G. W. Johnson**	Operation Plowshare
Ontario	**May 5**	Prince George Hotel	**F. G. Tatnall**	Testing Up-to-Date and Simplified
Oregon	**May 12**			
Peoria	**May 8**	Bradley Student Union	**Carl Swartz**	Continuous Casting
Philadelphia	**May 11**	Engineers Club	**N. J. Grant**	A Third Look at Russian Technology
Phoenix	**May**			Ladies Night
Purdue	**May 16**	Trails Restaurant	**Gerald Lewis**	What Makes Us Tick
Rhode Island	**May**			Dinner-Dance
Richmond	**May**	Executive Motor Hotel		Ladies Night
Rochester	**May 8**	Manger Hotel		Annual Meeting
Rockford	**May 24**		**Roger Watkins**	Heat Treatment and Brazing in Vacuum
Rocky Mountain	**May 19**	Oxford Hotel	**Merrill A. Scheil**	National Officers Night
Saginaw Valley	**May 20**	Rolling Green Country Club		Spring Dinner-Dance
St. Louis	**May 18**	Mallinckrodt Chemical Works	**L. W. Highley, Jr.**	Depleted Uranium as an Alloying Element in Steel
San Fernando Valley	**May 23**	Glen Aire Country Club	**A. E. Focke**	Nuclear Propulsion Aircraft
Sangamon Valley	**May 18**	Champaign		
Southeast Ohio	**May 19**	Zanesville Country Club		Annual Golf Party
Southern Tier	**May 8**	Cornell University		
Springfield	**May 15**			
Syracuse	**May 20**	Hinerwadel's		Annual Clambake
Texas	**May 2**		**E. D. Verink**	Application of Aluminum
Toledo	**May 11**	Maumee River Yacht Club	**Morris Cohen**	Nature of Hardened Steel
Tri-City	**May 9**		**Kent R. Van Horn**	Research in the Aluminum Industry
Tulsa	**May 2**		**Henry Barclay**	
Upper Ohio Valley	**May 10**			Plant Tour
Washington	**May 9**	AAUW Headquarters	**W. A. Pennington**	Diffusion and Transport of Carbon in Ferrous Alloys
Western Ontario	**May 26**	Drop-Inn Tavern		Sustaining Members Night
Wichita	**May 16**	Continental Grill	**Robert L. Sproat**	Precision Fastener Materials and Manufacturing
Wilmington	**May 10**	Fabian's Restaurant	**M. J. Weldon**	Toolsteels
York	**May 27**			Ladies Night

EMPLOYMENT SERVICE BUREAU

Operated on a no-charge basis for A.S.M. members in good standing. Ads are limited to 50 words and only one insertion of any one ad. Address answers to: Box No., American Society for Metals, Metals Park, Novelty, Ohio, unless otherwise stated.

POSITIONS OPEN

East

PHYSICAL METALLURGIST OR SOLID-STATE PHYSICIST: Applied research on a broad spectrum of solid-state sensors for measuring temperature, pressure, flow, radiation (visible and infrared) and other physical quantities in industrial and aerospace applications. Includes theoretical and experimental work on materials exhibiting photoconductive, photovoltaic, thermoelectric, piezo-magnetic and piezo-resistive effects. Write to: H. E. Crabtree, Mgr., Engr. Admin., Instrument Dept., General Electric Co., 44 Federal St., W. Lynn, Mass.

Midwest

METALLURGICAL ENGINEER - GRADUATE: Experience in low-alloy and austenitic high-temperature alloys preferred, but will consider recent graduate. Assignment in process control laboratory of major automotive parts manufacturer. Work covers forging, cold forming, heat treating methods. $6500-$9600. Cleveland. Box 4-5.

TOOLSTEEL SALESMAN: Under 40 years of age, wanted by steel warehouse. Experience and knowledge of proper application necessary. Starting salary approximately $5000 plus commission. Warehouse located in Davenport, Iowa. Box 4-10.

METALLURGICAL ENGINEER: Teaching and research position at progressive institution. Applicant should have interest in area of physical metallurgy as a whole, rather than in some relatively narrow aspect of the subject. Teaching will involve undergraduates and graduate level instruction. Research probably will require familiarity with electron microscopy and X-ray diffraction techniques, as well as vacuum melting and fabricating operations. Rank and salary commensurate with experience. Send complete résumé to Box 4-15.

RESEARCH AND DEVELOPMENT ENGINEER: Welding concern in Cleveland area desires man with metallurgical and electrical background and interest in developing and applying fundamental principles to practical production problems. Must be capable of adapting to unusual methods and working closely with a small compatible research group. Box 4-25.

West

FELLOWSHIPS AND ASSISTANTSHIPS: Advanced degree students in physical metallurgy. Emphasis on phase equilibria, crystal imperfections, plastic deformation in alloys, ceramics and intermetallics. Applicants with degrees in the physical sciences or engineering will be considered. Full-time summer research employment available. Contact: Dept. of Metallurgy, University of Denver, Denver 10, Colo.

METALLURGIST (DEVELOPMENT): B.S. in metallurgy or metallurgical engineering, with 3 to 5 years experience, preferably with some experience in high-temperature alloys and high-strength steels. The assignment would be developmental in nature and would require the implementation of results of the developmental work into production practice which will entail cooperation with personnel in the operating departments. Send replies to: Cameron Iron Works, Inc., P.O. Box 1212, Houston 1, Tex.

SCHOLARSHIPS AND FELLOWSHIPS: For graduate study in metallurgy leading to the M.S. or Ph.D. degree, with emphasis in physical metallurgy. Current courses and research are centered around thermodynamics and phase transformations, X-ray diffraction, lattice imperfection theory, mechanical metallurgy and electron theory of metals. Applicants with degrees in the physical sciences or engineering will be considered. Write to: Alan J. Chapman, Chairman, Dept. of Mechanical Engineering, William Marsh Rice University, Houston, Tex.

Canada

RESEARCH METALLURGIST: To work on alloy cast iron. Recent M.S. degree or B.S. with three years experience. Location, Toronto. Send complete résumé: Box 4-20.

South

FERROUS METALLURGIST: For large industrial plant in central Alabama, with a minimum of eight years experience. Work involves complete plant metallurgy, primarily with iron products. Knowledge of foundry operations very helpful, including familiarity with nodular iron. Box 4-125.

POSITIONS WANTED

METALLURGIST: M.S., age 35, family, immediately available. Nine years experience in

applied research and development. Process metallurgy of ferrous and nonferrous alloys including nuclear, high-temperature and refractory materials. Background in mechanical metallurgy emphasizing fabrication and allied physical metallurgy. Assistance to plant production. Desires challenging and responsible position requiring initiative. Box 4-30.

METALLURGICAL ENGINEER: B.S. degree, age 35, family, veteran. Ten years ferrous metallurgy experience with respected concerns includes melting supervision and plant metallurgist in high production iron foundries and research on cast and wrought stainless steels and nickel-base alloys. Desires career position in production supervision or metallurgical development. Midwest preferred. Résumé on request. Box 4-35.

METALLURGICAL ENGINEER: M.S., age 37. Over nine years experience, principally in alloy development, materials application and metals joining. Thorough knowledge of high-temperature, refractory, ferrous, nonferrous and light alloys. Desires responsible position in metallurgical field with opportunities for advancement. Box 4-40.

METALLURGIST OR METALLURGICAL ENGINEER: B.S. degree, currently taking graduate industrial management study. Age 25, single, draft exempt. Two years laboratory quality control experience in physical testing, laboratory heat treatment and metallography of nonferrous, ferrous and refractory materials. Desires similar position. Prefers Northeast U.S. or Canada. Available July 1961. Résumé on request. Box 4-45.

METALLURGIST: Age 44, seven years experience in heat treating and casting permanent magnets, eight years as metallurgist for large alloy steel company, three years as metallurgist for screw company. Good background in ferrous metallurgy, experienced supervisor. Desires metallurgical position with small or medium-size company in Midwest. Résumé on request. Box 4-50.

METAL TUBING SUPERVISOR: B.S. married, age 48. Top-level supervisory experience. Induction and resistance welding of aluminum, stainless and cold rolled steel. Brazing of steel, nickel and Monel. Extrusion, rod and mandrel drawing of ferrous and nonferrous. Quality minded, cost conscious producer. Desires top-level position with bonus plan. Box 4-55.

DEVELOPMENT METALLURGIST: B.A. Sc., professional engineer, age 36, married. Thirteen years development metallurgy, Canada and U.S. Three years process research, nickel; six years foundry chief metallurgist, gray, alloy, ductile cast iron; technical and management level. Four years product development, alloys for iron and steel industry. Résumé on request. Box 4-60.

RESEARCH PHYSICAL METALLURGIST: B.S. in metallurgical engineering. Veteran, age 40, four children. Fifteen years diversified experience with cast iron, powder metallurgy, cermets, phase transformation, brazing, metallography, metal cladding. German translator. Specialist in design and conduct of experiments to evaluate practicality of theoretical concepts. Midwest preferred. Available immediately. Box 4-65.

METALLURGICAL ENGINEER: Met. E., age 36, family. Nine years experience, five in automotive-type gray iron foundry, four in production metallurgy, agricultural implements. Desires position in either customer service or sales. Willing to relocate for right position. Box 4-70.

REGISTERED PROFESSIONAL ENGINEER: Metallurgical graduate with 14 years widely diversified industrial experience, desires employment in the southwest part of the United States or foreign. Box 4-75.

ENGINEERING AND MANUFACTURING MANAGEMENT: B.S. degree. Nine years experience in aircraft joining, heat treating and forming of ferrous and nonferrous metals. All phases including engineering, quality control, manufacturing and sales. Department head status has given balance in technical and business aspects. Box 4-80.

REGISTERED PROFESSIONAL ENGINEER: B.S., with ten years industrial experience in materials and processes. Specialization in stainless steels, superalloys, reactive and refractory metals includes vacuum melt, forge and fabrication staff positions. Also worked four years as research metallurgist at internationally known laboratory. Age 37, married, veteran. Desires responsible staff position with assured future for utilization of leadership abilities. Box 4-85.

PHYSICAL METALLURGIST: Age 36. Eight years experience in research of high-alloy specialty irons and steels. Development of fabrication techniques for nonferrous and refractory alloys. Desires position where individual achievements are recognized. Box 4-90.

METALLURGIST: B.S. degree, M.S. in management engineering, age 36, married. Experience in ferrous and nonferrous materials from permanent magnets to vacuum melted superalloys with emphasis on cast metals. Top-level supervisory and technical responsibilities. Broad experience in ceramics, plastics, heat treating and inspection methods. Desires tech-

nical management or supervisory position. Box 4-95.

METALLURGICAL AND MATERIALS ENGINEER: Degree, 15 years experience, one company, in metallurgical, corrosion and materials engineering. Last ten years supervisor metallurgical and corrosion laboratories responsible for development, evaluation and application of new metals and materials, corrosion prevention, metallurgical investigation. Reliable, honest, competent. Wants more responsibility, greater management appreciation. Present compensation $16,000 plus. Box 4-100.

METALLURGICAL SALES: B.A. in chemistry, nine years experience as sales engineer and district manager for manufacturer of heat treating equipment, five years in sales and advertising with leading producer of ferroalloys. Familiar with ferrous heat treatment and melting practice, some nonferrous. Age 41, will relocate. Box 4-105.

CHIEF OR ASSISTANT CHIEF METALLURGIST: Currently supervising research and development work in powder metallurgy, titanium, gas turbine materials. Strong background in control lab operation, material selection, specification and processing (includes ferrous, nonferrous, coatings, joining, ceramics, plastics). Active in Detroit technical societies, community affairs. B.S. degree, age 39, family. Ready for added responsibility. Box 4-110.

METALLURGICAL ENGINEER: B.S. degree, age 25, family. Three years experience as quality control metallurgist with integrated steel producer. Desires responsible position in technical sales or as metallurgical engineer. $7800 minimum annual salary. Midwest preferred. Résumé on request. Box 4-115.

TECHNICAL SALES: Specialist abrasion resistant materials, metallic, nonmetallic including elastomers. Thoroughly familiar with all fabrication methods. Eighteen years application experience in high-alloy steels, constructional, stainless, tool and low-alloy high-strength. Top-level division management experience, sales, accounting, warehousing. Location immaterial. Résumé on request. Box 4-120.

METALLURGICAL ENGINEER: Married, B.S. degree in metallurgical engineering, B.A. degree in Spanish. Strong background in metallography, alloy and processes development. Experience in steel, in Germany, and electronics, U.S. Fluent in five languages. Desires overseas position, preferably South America or Europe. Résumé on request. Box 4-130.

SPRING DESIGN ENGINEER AND METALLURGIST: Canadian of European origin, seeks position in Canada or United States. Experienced in design of cold helical, clock, flat, hot compression, tension and torsion springs; specifying materials and finishes; heat treatment for hot and cold springs for tool room. Metallurgical checks on incoming materials and finished springs. Box 4-135.

METALLURGICAL ENGINEER: Graduate with over 15 years diversified metallurgical experience in U.S. and abroad, age 34, family. Extensive experience in quality control, trouble shooting of metal manufacturing problems, ferrous and nonferrous heat treatment, processing and fabrication techniques. An industrious self starter with seven years supervisory and consulting experience. Will relocate. Box 4-140.

GROUP LEADER: Ten successful years in metallurgical research and development applicable to any industry. M.Sc. degrees in metallurgy and industrial management. Desires more administrative line responsibility. Salary open. Prefers southern location but will strongly consider other locations. Complete resume and academic record transcripts on request. Box 4-145.

METALLURGICAL ENGINEER: B.S. degree, age 31, married. Ten years diversified experience in ferrous and nonferrous metallurgy including three years in petroleum industry, two years government proving grounds, five years diesel locomotive industry. Experience includes failure analysis, quality control inspection, material specifications, customer contact work. Supervisory experience. Resume on request. Box 4-150.

RESEARCH AND DEVELOPMENT MANAGER: Heavy experience in metallurgical research and development supervision plus top-notch engineering work. Knows research and development personnel, program planning, budgeting and execution. Broad experience with aluminum, reactive metals, high-temperature alloys, cast iron, steels and oxide ceramics. Mid-30's, M.S. degree, publications. Box 4-155.

TEST TECHNICIAN, RESEARCH AND DEVELOPMENT OR PRODUCTION METALLURGY: Completed three year mechanical design course, two year metallurgy course, one year electronic-physics, one year welding engineering. Six years experience in structural and environmental testing, two years supervision in subassembly work in charge of fabrication and welding problems. Desires position in any field related to above in Philadelphia area. Box 4-160.

FOUNDRY METALLURGIST: 93% of casting buyers rate quality as the first criteria influencing where they purchase. MIT graduate in metallurgical engineering with 12 years experience meeting strict quality rquirements. Has demonstrated record of effectiveness in technical and managerial positions resulting in substantial quality cost improvements in production of all sizes steel, iron and nonferrous castings. Seeking challenging management responsibility. Box 4-165.

the 3 minute glass

One of the truly great things which ASM has accomplished during the past eight years has been the sponsorship of the Science Achievement Awards. Since I write from the posture of a johnny-come-lately, I can make this enthusiastic remark impartially and without reservation about what your Society has done.

The Science Achievement Award program was conceived by the fertile minds of the late, great Bill Eisenman, ASM's Secretary for 40 years, and Bob Carelton, Executive Secretary for the National Science Teachers Association.

The plan has been simple, and highly functional. Students in junior and senior high school levels have been encouraged, through their science teachers, to enter projects that reflect the scientific method. The projects are documented accounts, complete with text, tables, charts, graphs and photographs, of experiments carried out by the youngsters. Entries are completed by the end of February of each school year, and are judged on a regional basis, 11 regions to the country. Winners in this regional judging are eligible for awards: 7th and 8th grades, $25 savings bonds; 9th and 10th grades, $50 savings bonds; 11th and 12th grades, $75 savings bonds. Additionally, honorable mentions are awarded in quantities. Schools having winners receive an attractive plaque.

All entries that have to do with metallurgy are forwarded to NSTA in Washington for judging by a committee of ASM members. Winners of this phase of the contest receive $100 savings bonds.

Some of the entries have been fantastically complex and well-conceived. Entries in the general field of metals (such as: "Magnesium From Chlorophyll", 8th grader; "Inhibition of Corrosion", 10th grader; "Study of Freezing Temperatures for Binary and Ternary Mixtures of Lead, Tin and Bismuth", 12th grader; "Extraction of Tantalum, Columbium and Rare Earth Metals", 12th grader; "A Study of Metal Whiskers", 12th grader, have caused Physicist Glenn Geil of the National Bureau of Standards, who with others has judged many of these contests, to comment. "These entries are giving us an inferiority complex!"

But equally intriguing and even more mysterious to those associated with the metals and materials field are the entries by youngsters whose interests are in other directions. Here are some examples of regional winners:

"Visible Effects of Radiation on Diatoms" — 9th grader

"Variations in Electrical Resistance of Trees" — 10th grader

"Effect of an Alcohol Diet on Maze Learning of Hamsters" — 9th grader

"Effects of an Enzyme on the Protein Coat of a Virus" — 12th grader

"Biological Antagonism" — 8th grader

"Studies in Bacterial Mutation" — 11th grader

"Single Signal Multi-Channel Photo Recording" — 11th grader

"Factors Affecting Speed of Soap Box Derby Racers" — 7th grader

Response to the project has been good. Although the initial effort in 1952 was modest, the school year 1959-60 saw 33,000 youngsters requesting entry material. One out of five of these matured into actual entries, many hours of hard work later.

This has been an effort to interest youngsters in science, engineering and related fields. The following table, based on an analysis of over 500 winners for several years, shows the broad areas of technology that have been represented.

Biological Sciences	44.4%
Physical Sciences	38.9%
Mathematics	5.5%
Earth Science (includes metallurgy)	9.7%
Other	1.5%
	100.0%

It can readily be seen that the Science Achievement Award program, meritorious though it certainly is, has not brought forth any overwhelming manifestation of interest by youngsters in the field of metallurgy. As a matter of fact, of the 6450 actual entries in the 1959-60 school year, only 250 were in the general area of metals.

ASM's sponsorship of the program has cost the Society about $20,000 a year in recent years. In its eight-year history the undertaking has exceeded a total of $125,000.

We are now aware of several important conclusions:

(1) The worth of the Science Achievement Awards is beyond question, and should be continued for many years forward. The endorsement of the program by the Association of Secondary School Principals is only one testimony to its importance.

(2) ASM has single-handedly been attempting to take on the overwhelming task of interesting secondary school youngsters throughout the land in all fields of the physical and life sciences and asso-

MEI SUMMER COURSES

The Metals Engineering Institute is planning to offer several intensive one-week courses in "Principles of Heat Treating" at a number of locations throughout the country. Already scheduled thus far are courses in Cleveland, May 22 through 26; and Philadelphia, June 26 through 30. Other locations under consideration are Pittsburgh, Long Island and Detroit. In addition to the heat treating courses, MEI is planning a one-week course in "Physical Metallurgy" to be given at Kent State University, Kent, Ohio, from July 17 through 21.

For further information concerning any of the above programs, please write to:

Metals Engineering Institute
Dept. SC
Metals Park
Novelty, Ohio

ciated technologies.

(3) Although the current rate of entries has been gratifying, since there is much competition for the time of youngsters and teachers alike, there is still tremendous room for increased participation. There are more than 25,000 high schools in the United States, and the largest number of students entering the competition has been 6450.

(4) The $20,000 rate at which ASM had been financing the program in recent years is not adequate for the expansion needed. It could even be observed that limited to this rate of expenditure, sole sponsorship of ASM is in effect holding the program back from its natural growth.

(5) The rate of expenditure for encouraging interest in metals and related fields is, however, disproportionately high ($80 for each single entry).

(6) The mechanics of the program are well established and smoothly functioning. This is not a Cloud Nine project, yet to be proved.

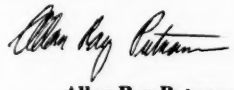
The future of the Science Achievement Awards program was in question, unfortunately, when a critical review of ASM's financial situation showed clearly that ASM could not afford to expand its support of the program, and as a matter of cold fact it would have to reduce its support during the school year 1960-61 to one-tenth of its former annual rate. Yet all are aware of a strong moral obligation not to let this worthy project founder on financial rocks.

The National Science Teachers Association has succeeded in providing the necessary funds to keep the regional awards program in motion for the current school year. As a matter of necessary economy the national metals awards have been temporarily suspended.

What about future years? Government funds could not be employed in this program because of the "award" element of the program, according to NSTA. It is apparent that any one of many industrial concerns might be interested in taking over the program *in toto* as a significant public service (witness the Westinghouse Talent Search), but more importantly, this seemed to be an excellent opportunity to bring together a broad spectrum of scientific, engineering and technical societies in a joint effort widely beneficial to their active and latent interests in the youth of the country.

This last is the course that has been chosen. We of ASM have met, together with NSTA personnel, with representatives of 45 societies thus far in discussions in Washington, New York and Chicago. Such diverse groups as American Medical Association, American Institute of Physics, American Meteorological Society, Society of Automotive Engineers, Society of Naval Architects and Marine Engineers, American Dental Association, American Chemical Society, Society of American Bacteriologists, and many others, are having the program currently considered by their Boards of Directors and other responsible groups this spring with the hope that the $1000 that each society is being requested to put into this effort will assure the continuation and expansion of the program for the school year 1961-62 and beyond.

As an ASM member you can be justifiably proud of what your Society has done in the past with the Science Achievement Awards, and the leadership it is currently exerting to assure their continuation.



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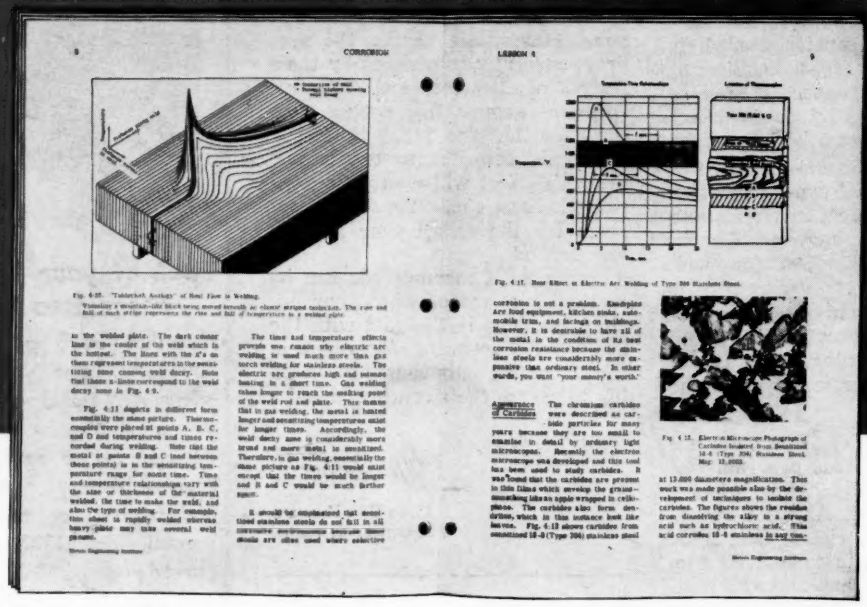

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Dr. Fontana graduated from the University of Michigan with a B.S. in Chemical Engineering, and a Ph.D. in Metallurgical Engineering. From 1934 to 1945 he served as metallurgical engineer and supervisor in the Engineering Department, E. I. du Pont de Nemours and Co., Inc., Wilmington, Delaware. He is presently Professor and Chairman, Department of Metallurgical Engineering; Director, Corrosion Research Laboratories, Engineering Experiment Station, Ohio State University.

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